

That Which Is Claimed Is:

1. A method for electroplating metal from an electroplating solution on a conductive surface wherein the electroplating solution is adjacent the conductive surface, the method comprising:

passing an electrical current through the conductive surface and the electroplating solution adjacent the conductive surface;

determining an electroplating voltage based on the electrical current through the conductive surface and the electroplating solution adjacent the conductive surface; and

maintaining the determined electroplating voltage while electroplating the metal from the electroplating solution on the conductive surface.

2. A method according to Claim 1 wherein maintaining the determined electroplating voltage comprises allowing an electroplating current to vary while electroplating the metal from the electroplating solution on the conductive surface.

3. A method according to Claim 1 further comprising:

integrating an electroplating current while electroplating the metal from the electroplating solution on the conductive surface to determine a total electroplating charge; and

ceasing electroplating when the total electroplating charge reaches a predetermined threshold.

4. A method according to Claim 1 wherein the conductive surface comprises a seed layer on a microelectronic substrate and an electroplating mask on the seed layer opposite the substrate wherein the electroplating mask exposes portions of the seed layer for electroplating.

5. A method according to Claim 1 wherein passing an electrical current comprises generating a desired initial electroplating current through the conductive surface and the electroplating solution, and wherein determining

an electroplating voltage comprises determining a electroplating voltage resulting at the desired initial electroplating current.

5 6. A method according to Claim 5 wherein generating an initial electroplating current comprises varying an applied voltage until a desired initial electroplating current is achieved.

10 7. A method according to Claim 5 wherein generating an initial electroplating current comprises generating an initial electroplating current calculated to provide a predetermined electroplating rate on an initial electroplating surface area.

15 8. A method according to Claim 5 wherein generating an initial electroplating current through the conductive surface and the electroplating solution comprises generating the initial electroplating current through an anode, the electroplating solution, and the conductive surface, and wherein maintaining the determined electroplating voltage comprises maintaining the determined electroplating voltage while electroplating the metal from the electroplating solution on the conductive surface to provide a variable
20 electroplating current through the same anode, the same electroplating solution, and the same conductive surface.

25 9. A method according to Claim 5 wherein determining the electroplating voltage is followed by deplating metal plated when generating the initial electroplating current and wherein deplating metal plated when generating the initial electroplating current is followed by maintaining the determined electroplating voltage while electroplating the metal on the conductive surface.

30 10. A method according to Claim 1:

wherein passing an electrical current through the conductive surface and the electroplating solution comprises estimating a voltage-current function using currents through the conductive surface and electroplating solution, and estimating an inflection point in the voltage-current function; and

wherein determining the electroplating voltage comprises determining the electroplating voltage based on the estimated inflection point in the voltage-current function.

5 11. A method according to Claim 10 wherein determining the electroplating voltage comprises determining the electroplating voltage having an absolute value less than or equal to an absolute value of a voltage at the estimated inflection point of the voltage-current function.

10 12. A method according to Claim 10 wherein determining the electroplating voltage is followed by deplating metal plated when estimating the voltage-current function and wherein deplating metal plated when generating the voltage current function is followed by maintaining the determined electroplating voltage while electroplating the metal from the
15 electroplating solution on the conductive surface.

 13. A system for electroplating metal from an electroplating solution on a conductive surface wherein the electroplating solution is adjacent the conductive surface, the system comprising:

20 means for passing an electrical current through the conductive surface and the electroplating solution adjacent the conductive surface;
 means for determining an electroplating voltage based on the electrical current through the conductive surface and the electroplating solution adjacent the conductive surface; and
25 means for maintaining the determined electroplating voltage while electroplating the metal from the electroplating solution on the conductive surface.

 14. A system according to Claim 13 wherein the means for maintaining
30 the determined electroplating voltage comprises means for allowing an electroplating current to vary while electroplating the metal from the electroplating solution on the conductive surface.

 15. A system according to Claim 13 further comprising:

means for integrating an electroplating current while electroplating the metal from the electroplating solution on the conductive surface to determine a total electroplating charge; and

means for ceasing electroplating when the total electroplating charge reaches a predetermined threshold.

16. A system according to Claim 13 wherein the conductive surface comprises a seed layer on a microelectronic substrate and an electroplating mask on the seed layer opposite the substrate wherein the electroplating mask exposes portions of the seed layer for electroplating.

17. A system according to Claim 13 wherein the means for passing an electrical current comprises means for generating a desired initial electroplating current through the conductive surface and the electroplating solution, and wherein the means for determining an electroplating voltage comprises means for determining an electroplating voltage resulting at the desired initial electroplating current.

18. A system according to Claim 17 wherein the means for generating an initial electroplating current comprises varying an applied voltage until a desired initial electroplating current is achieved.

19. A system according to Claim 17 wherein the means for generating an initial electroplating current comprises means for generating an initial electroplating current calculated to provide a predetermined electroplating rate on an initial electroplating surface area.

20. A system according to Claim 17 wherein the means for generating an initial electroplating current through the conductive surface and the electroplating solution comprises means for generating the initial electroplating current through an anode, the electroplating solution, and the conductive surface, and wherein the means for maintaining the determined electroplating voltage comprises means for maintaining the determined electroplating voltage while electroplating the metal from the electroplating

solution on the conductive surface to provide a variable electroplating current through the same anode, the same electroplating solution, and the same conductive surface.

5 21. A system according to Claim 17 further comprising:
 means for deplating metal plated when generating the initial
electroplating current wherein deplating metal plated when generating the
initial electroplating current is followed by maintaining the determined
electroplating voltage while electroplating the metal on the conductive surface.

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 22. A system according to Claim 13:
 wherein the means for passing an electrical current through the
conductive surface and the electroplating solution comprises means for
estimating a voltage-current function using currents through the conductive
15 surface and electroplating solution, and means for estimating an inflection
point in the voltage-current function; and

 wherein the means for determining the electroplating voltage
comprises means for determining the electroplating voltage based on the
estimated inflection point in the voltage-current function.

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 23. A system according to Claim 22 wherein the means for
determining the electroplating voltage comprises determining the
electroplating voltage having an absolute value less than or equal to an
absolute value of a voltage at the estimated inflection point of the voltage-
25 current function.

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 24. A system according to Claim 22 further comprising:
 means for deplating metal plated when estimating the voltage-current
function wherein deplating metal plated when generating the voltage current
30 function is followed by maintaining the determined electroplating voltage while
electroplating the metal from the electroplating solution on the conductive
surface.

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25. A system for electroplating metal from an electroplating solution on a conductive surface wherein the electroplating solution is adjacent the conductive surface, the system comprising:

a plating controller that passes an electrical current through the conductive surface and the electroplating solution adjacent the conductive surface, that determines an electroplating voltage based on the electrical current through the conductive surface and the electroplating solution adjacent the conductive surface, and that maintains the determined electroplating voltage while electroplating the metal from the electroplating solution on the conductive surface.

26. A system according to Claim 25 wherein the plating controller allows an electroplating current to vary while electroplating the metal from the electroplating solution on the conductive surface and maintaining the determined electroplating voltage.

27. A system according to Claim 25 wherein the plating controller integrates an electroplating current while electroplating the metal from the electroplating solution on the conductive surface to determine a total electroplating charge, and wherein the plating controller ceases electroplating when the total electroplating charge reaches a predetermined threshold.

28. A system according to Claim 25 wherein the conductive surface comprises a seed layer on a microelectronic substrate and an electroplating mask on the seed layer opposite the substrate wherein the electroplating mask exposes portions of the seed layer for electroplating.

29. A system according to Claim 25 wherein the plating controller passes an electrical current by generating a desired initial electroplating current through the conductive surface and the electroplating solution, and wherein the plating controller determines an electroplating voltage by determining an electroplating voltage resulting at the desired initial electroplating current.

30. A system according to Claim 29 wherein the plating controller generates an initial electroplating current by varying an applied voltage until a desired initial electroplating current is achieved.

5 31. A system according to Claim 29 wherein the plating controller generates an initial electroplating current by generating an initial electroplating current calculated to provide a predetermined electroplating rate on an initial electroplating surface area.

10 32. A system according to Claim 29 wherein the plating controller generates an initial electroplating current through the conductive surface and the electroplating solution by generating the initial electroplating current through an anode, the electroplating solution, and the conductive surface, and wherein the plating controller maintains the determined electroplating voltage by maintaining the determined electroplating voltage while electroplating the metal from the electroplating solution on the conductive surface to provide a variable electroplating current through the same anode, the same electroplating solution, and the same conductive surface.

15 33. A system according to Claim 29 wherein determining the electroplating voltage is followed by deplating metal plated when generating the initial electroplating current and wherein deplating metal plated when generating the initial electroplating current is followed by maintaining the determined electroplating voltage while electroplating the metal on the conductive surface.

20 34. A system according to Claim 25 wherein the plating controller estimates a voltage-current function using currents through the conductive surface and electroplating solution, wherein the plating controller estimates an inflection point in the voltage-current function, and wherein the plating controller determines the electroplating voltage by determining the electroplating voltage based on the estimated inflection point in the voltage-current function.

35. A system according to Claim 34 wherein the plating controller determines the electroplating voltage having an absolute value less than or equal to an absolute value of a voltage at the estimated inflection point of the voltage-current function.

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36. A system according to Claim 34 wherein the plating controller deplates metal plated when estimating the voltage-current function, and wherein the plating controller maintains the determined electroplating voltage while electroplating the metal from the electroplating solution on the
10 conductive surface after deplating metal plated when estimating the voltage-current function.